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China's Telecommunications: Present and Future

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Executive Summary

By the end of 1995, China had built the world's ten largest telecommunications networks and the industry was growing at a faster rate than any other sector of the booming Chinese economy. For example, the country's 40 million telephone subscribers with 50 million telephone numbers represented an average annual growth rate of nearly 100 percent over a ten-year period. Internet users served by ChinaNet jumped from 6,000 in 1995 to 53,739 in March 1997. Progress was qualitative as well, as China procured state-of-the-art fiber-optic and satellite technologies and narrowed the gap between itself and the United States and between its own urban and rural areas. The achievement can be attributed to the government's commitment to telecommunications as the key to further development—a commitment backed by preferential policies; to foreign financial and technical support; and to changing attitudes of the Chinese people themselves.

However, China faces some major problems. The gap in living standards between coastal and interior provinces is widening, as people migrate from poor villages to increasingly affluent cities. The government must focus more on developing isolated regions. Rapid development of telecommunications cannot be sustained under a government monopoly, which aids the government's economic and security interests but discourages foreign companies from investing and transferring technology. At the same time, there has been little headway in developing domestic telecommunications products. Management of the industry is chaotic in the absence of clear regulations, and a multilayered bureaucracy encourages wasted resources, duplication, red tape, and corruption. Political problems are likely to emerge as telecommunications continues to help open Chinese society and young Chinese come to embrace Western industrial culture.

Nevertheless, China is destined to become and remain the world's "super market" as long as it remains politically stable in its transition from a plannned to a market economy. Telecommunications will continue to play a key role during this transition.

China's Telecommunications: Present and Future

Yunpeng Hao

China's Eighth Five-Year Plan period (1991–95) marked a milestone in telecommunications development. By the end of that period, China had built the ten largest networks in the world.[1] Telecommunications grew at a faster pace than the national economy,[2] as it evolved from analog to digital, manual to automatic, telephone-only to multiple-service, and national to international in coverage. This historic process represented a fundamental commitment of the Chinese government and a dramatic change in the national attitude toward communications.

The statistical record for 1991 to 1995 is impressive. A total of 241.4 billion yuan (US$29.4 billion) was invested in fixed posts and telecommunications assets during that period, twelve times the amount during the Seventh Five-Year Plan (1986–90).[3] By the end of 1995, China had 40 million telephone subscribers with a total of 50 million telephone numbers, almost ten times the volume in 1985.[4] China's public mobile communications chalked up remarkable achievements in terms of network scale and telecommunications capability.[5] The number of mobile telephone subscribers had increased from 47,500 in 1991 to 5 million by June 1996.[6] At present, China's mobile communications networks cover most townships.[7] Pager subscribers similarly had jumped from 874,000 in 1991 to 19.83 million by the end of April 1996,[8] placing China second only to the United States, which has 27 million pagers in use.[9]

There was also a dramatic qualitative shift during the Eighth Five-Year Plan period, with the rapid development of fiber optics and satellite telecommunications. A backbone fiber-optic network of 22 cables grew by more than 37,000 km, an average 92 percent annual growth, connecting cities at the prefecture level and above and linking all provincial capitals except Lhasa. Long-distance fiber-optic cables totaled 86,000 km, 75 percent of the total length of long-distance electronic cables. Fifty percent of long-distance telephone circuits were provided by fiber-optic cables, up from 10 percent five years ago.[10]

Also during this period, China completed the expansion of 13 satellite earth stations. By the end of 1995, there were 21 earth stations located in the provincial capital cities.[11] China

The author extends a special word of appreciation to Professor John W. Lewis, who helped to make this paper a reality.

has converted its domestic satellite communication technology from analog to digital. The current network is now capable of carrying voice, picture, and data traffic, whereas the old network could carry only voice traffic. Data Retrieval (ER), facsimile store-and-forward, frame relay, Internet access, Directorate General of Telecommunications (DGT) Calling Card Services (200 services), and international 800 services with some countries grew rapidly.[12]

Public access to the Internet was first established in China around 1994, and the number of e-mail subscribers reached 6,000 by the end of 1995.[13] China was the 71st country to join the Internet.[14]

The list of China's accomplishments, plans, and challenges in this field goes on and on. We introduce some of these facts to highlight China's dramatic and troubled entry into the modern information age and introduce the main themes of this paper.

The Impact of Telecommunications Development

The remarkable changes in the telecommunications sector are ushering in changes to almost every aspect of life in China and will have a great impact on its future.

Economic Change

During the Eighth Five-Year Plan, the program of reform and opening to the world made breakthroughs. An overwhelming majority of the population now has enough food and clothing and is advancing toward a comfortable life. Television and radio are no longer symbols of wealth: Wealth is now defined by the ability to afford a house, a car, and the most advanced means of telecommunications. The gap between rich and poor has widened.

For a long time, most Chinese people were uninformed about life outside China and everyone had a similar standard of living. With limited access to the outside world, people had little desire to change their lives; for without exposure to new things, there is no urge to acquire them. But by the mid-1980s, Chinese people were beginning to travel abroad, and opportunities afforded by the Open Door policy were bringing foreigners to China.

China has made remarkable achievements in all economic sectors since then. Its original goal, to quadruple the 1980 GNP by 2000, was completed ahead of schedule in 1995 because of efforts made during the three five-year plans beginning with the 1981 to 1985 period.[15] As China entered the 1990s, the economy was growing quickly and sustaining its development. From 1991 through 1995, the average annual GDP growth rate was 11.7 percent.[16] During the same period, the average annual growth rate of total telecommunications business value was 55.13 percent, and of total telecommunications revenue, 54.05 percent.[17] These statistics reflect the fact that growth in China's telecommunications sector is much faster than in any other industry. Figures 1and 2show how rapidly China's telecommunications industry has grown.

Fig. 1 Telecom Business Value in China, 1991–2000

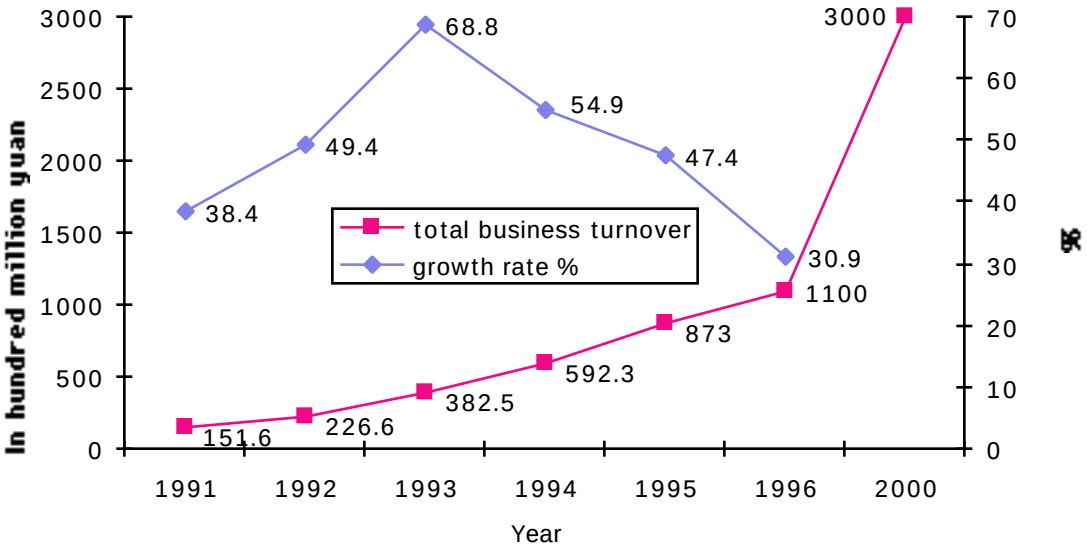
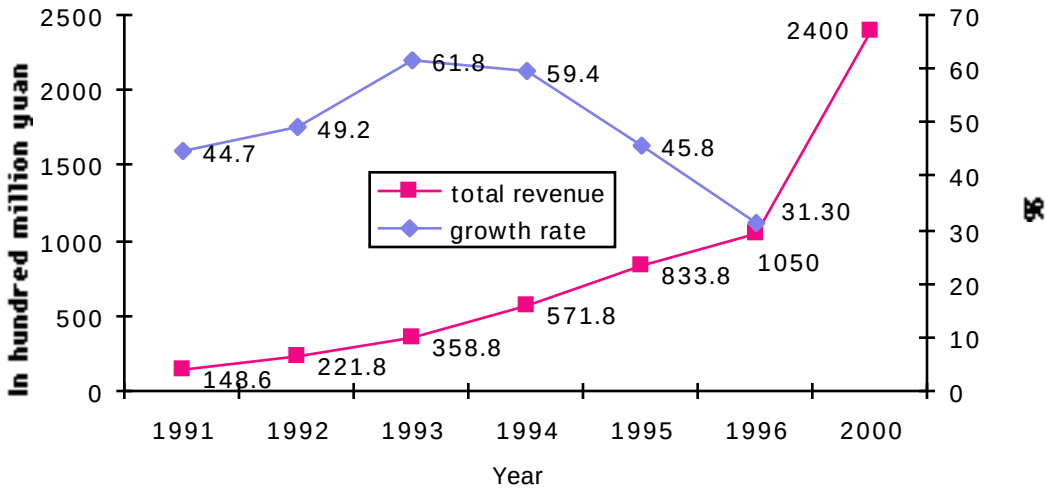


Fig. 2 Telecom Revenue in China, 1991–2000



China's telecommunications sector has implemented reform and modernization policies more effectively than other economic sectors. The main reason is that the government considers this industry a priority in meeting the requirements for economic development and fast information exchange both at home and abroad.

The sixteen-year implementation of the policy of reform and opening to the world has made China's economy more and more effective. Previously, it was hard to find Chinese products in Western countries but today, they abound. Successful business depends on the quick acquisition of information, which is made possible by advanced telecommunications technologies and media. Just as state-of-the-art telecommunications technology has accelerated China's economic development, rapid economic development has driven the continuous acquisition of new means of telecommunications.

China is in transition from a planned to a market-oriented economy. Growth has been rapid and the national economy has strengthened. The socialist market economic system is being established step by step, and the degree of marketization is rising. The overall pattern of opening to the outside world has been largely established, fundamentally changing the closed and semiclosed situations of the past. China will become and remain the world's "super market" as long as it remains politically stable. Telecommunications will continue to play a key role during this transition.

Changes in Perspective

In the 1970s, communication was limited to sending and receiving letters and occasionally making a phone call or sending a telegram. Now, as a result of the rapid development of China's telecommunications, people are benefiting from and coming to depend upon the new technology.

Another change has occurred. The Open Door policy has brought an influx of foreigners and foreign companies into the China market, and they have influenced Chinese thinking. Previously, for example, it was considered bad form to discuss money-making in public; now, such conversations are typical. In the past, few people considered a phone necessary or affordable. In the early 1980s, the government installed and paid for most phones, and in that decade mobile phones and pagers represented power or wealth. However, growing arrivals of foreign companies are providing a great opportunity for younger generations to accept advanced technologies. When food and clothing were no longer a problem for a majority of the population, people came to realize that information is the key to development, and communications is the key to information.

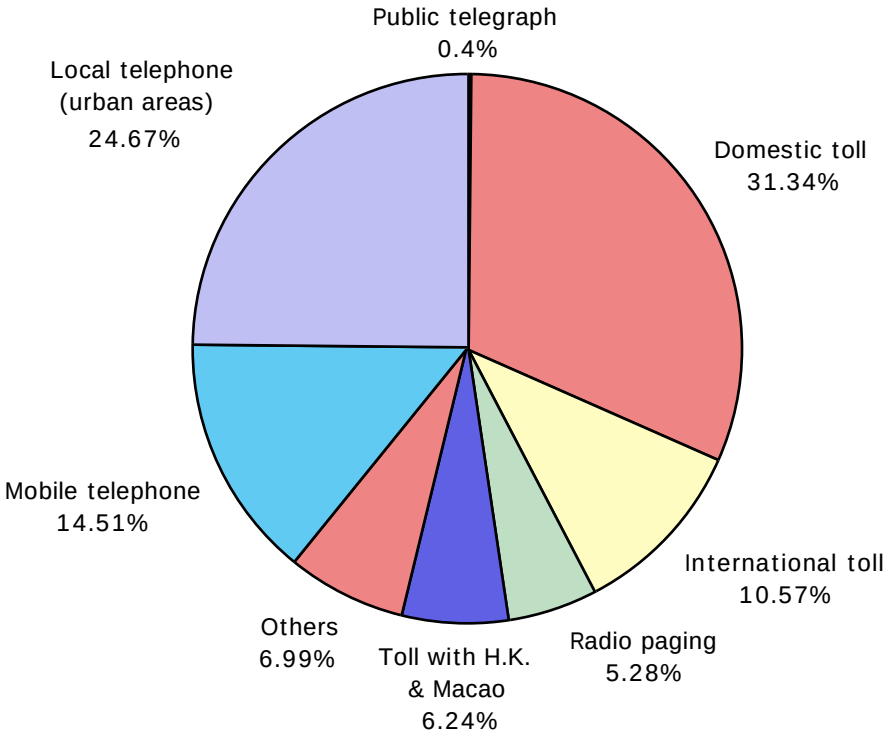
In addition, widespread use of advanced Western telecommunications technologies has generated admiration for the Western way of life and industrial culture. In the past decade, a pro-Western mindset has become common among young Chinese intellectuals.

China's first Internet connection came in 1988, with the installation of the China Academic Network (CANET). CANET essentially established an e-mail link to the Internet via the gateway in Karlsruhe, Germany. In 1990, the China Education and Research Network (CERNET) was established to exchange information directly with Stanford University in the United States. In 1993, a full Internet connection was established for the China Institute of High Energy Physics (IHEP), with Stanford University.

Since 1995, the number of Internet World Wide Web sites has increased daily. It seems that many people find it profitable to expand their Internet operations. People in the industry know that the Internet is the wave of the future and that those who are the first to occupy this niche will succeed, and businesses embrace an excellent opportunity to publicize their enterprises and their products at a much lower cost. They anticipate better results than from traditional mass media such as television, radio, and print. Figure 3 gives the current composition of China's telecommunications services (each service as a percentage of the total traffic).[18] Future growth is expected especially in the international toll and mobile categories.

The introduction of advanced telecommunications technologies into China has helped speed up changes in people's perspectives. China's Open Door policy toward Western investment and state-of-the-art equipment has influenced younger generations to accept Western industrial culture. All these changes have had a significant impact on the thinking of Chinese college students and young engineers and can be expected to produce tremendous results in Chinese society in the foreseeable future.

Fig. 3 The Current Composition of Telecom Services in China



Social Change in Urban, Rural, Coastal, and Interior Areas

Chinese society has changed dramatically during sixteen years of economic reform and opening to the world. No doubt such changes will continue in the near future. The transition of Chinese society will depend to a certain extent on the rapid development of telecommunications.

Although rural telephone penetration is not the fastest growing telecommunications sector, rural networks are growing at a faster pace than overall public networks in

many other Asian countries. The ratio of rural lines to urban lines that were installed in 1995 in China was approximately four to one, higher than in many other developing countries. However, it is still skewed given that China's rural areas hold nearly 80 percent of the country's population.[19] Despite recent rapid development, lack of access to information in the countryside and the inaccessibility of a considerable number of villages remain as major differences between China's cities and villages. Figures 4 and 5 summarize telephone penetration.

The gaps between some coastal cities and their suburbs have been significantly narrowed. In some rich rural areas, the penetration rate of residential phones is close to or even higher than the rate in urban areas. For example, in Guangxi, rural telephone subscribers reached 400,000 by the end of 1995, as compared to 300,000 urban telephone subscribers. Zhejiang province, which has one of the highest telephone penetration rates in the country, installed one line of rural exchange capacity for every 1.3 lines of urban exchange capacity in 1994.[20] Ninety percent of rural families in Sheyang County, Jiangsu Province, have phones at home.[21] From these statistics, we can see that the growth rate of subscribers in some rich rural areas is relatively greater than that in urban areas.

China's provinces vary sharply in their efforts to prioritize rural telecommunications. In general, wealthy provinces develop their rural telecommunications and increase the percentage of new lines installed in rural areas. Less developed provinces spend much less on rural telecommunications because local Posts and Telecommunications Administrations (PTA) are too poor to fund development programs. The gap between less developed and developed provinces is getting bigger. In Guangdong province, 33 percent of families have residential phones, and the ownership rate in Guangzhou, the provincial capital, has reached 40 percent of residents.[22] Twenty-eight percent of Beijing's residents now have phones[23] and one in three Shanghai households has a residential phone, but many cities in interior provinces lag far behind.[24] Guangdong towers above other provinces in terms of rural exchange lines as well as the switching capacity in rural areas, with a total of 4,341,590 lines installed from 1993 to 1995.[25] In contrast, some of the less developed provinces like Ningxia, Guizhou, Qinghai, Gansu, and Tibet, have fewer than 19,000 lines and changed little during the same period.

Exchanges between towns and villages are now frequent, and many people are moving into cities and coastal areas from villages and inland provinces. Rapidly developing telecommunications helps the government collect information more effectively in order to guide and control China's large transient population. In recent years, migration from villages to cities has both promoted the prosperity of cities and changed their composition. Rising crime is a common recent urban phenomenon that the authorities are doing their best to control, especially as part of their efforts to promote the prosperity of big cities. In this regard, the introduction of advanced telecommunications technologies is indispensable. In order to enhance their quick-response capabilities, the Chinese authorities have reportedly purchased much advanced telecommunications equipment for public security forces in many cities.

Moreover, the rapid development of telecommunications in China will accelerate the development of rural areas and help close the gap between coastal areas and inland provinces. Eventually, more towns and cities will be built in the interior, and its potentially huge productivity, tightly contained by conservative policies over the past decades, will affect relations between coastal areas and interior provinces. For example, competition between the two for financial and natural resources will eventually tighten their competition for markets, and this may have an impact on Chinese society.

Fig. 4 National Telephone Penetration, 1950–2000

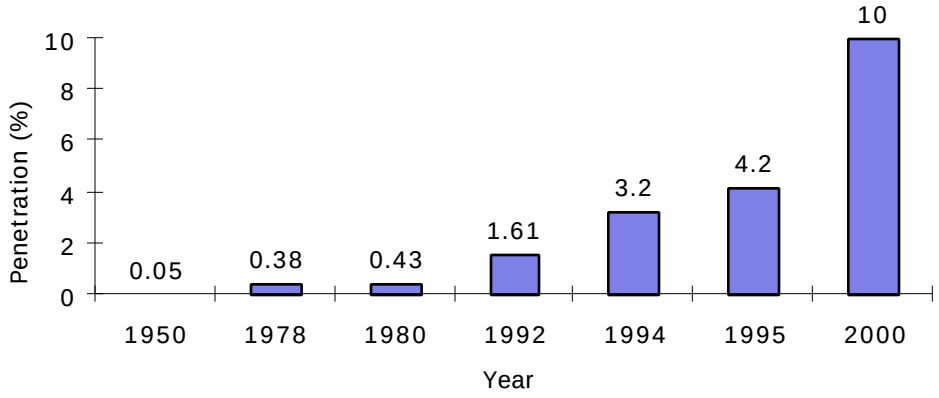
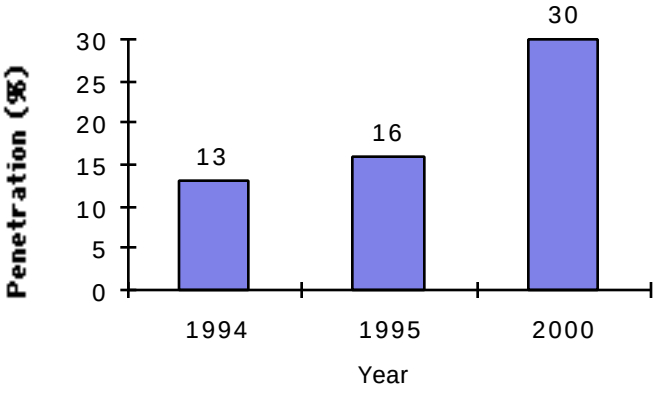


Fig. 5 Urban Telephone Penetration, 1994-2000



Political Change

For a long time, China did not recognize the effect of its outdated telecommunications infrastructure on the country's economy, but the Open Door policy brought a realization of the importance of telecommunications to development. In order to promote sustained, rapid, and healthy economic development and social progress, the Chinese government must strengthen national unity among people of all ethnic groups and bring every positive factor into play. Various telecommunications tools will play the most important role in realizing these goals.

Mass media are playing an increasing role in China's politics, and rapid advances in telecommunications are needed for them to deliver information. Certainly, Beijing's leaders, as firm Communists, have long paid attention to information delivery to ensure the mass communication of their viewpoints. In recent years, China has attached great importance to the rapidly evolving role of the telecommunications industry in promoting economic development and tightening domestic control.

Today, vigorous support from the government is still indispensable for the fast development of any given industry. In recent years, the Chinese government has given priority to building up the telecommunications infrastructure, as can be seen by the following policies:[26]

- Financial support: the Ministry of Posts and Telecommunications (MPT) can hold 90 percent of its profits.
- Foreign exchange control: MPT can hold 90 percent of the foreign exchange it has earned from non-trading channels.
- Partial forgiveness of government loans: Since 1986, MPT has had a remission of 90 percent of the principal and interest on its loans from the government.

Over the past decade, Beijing has seldom given similar preferential treatment to any other industrial sector.

Beijing's leaders regard the telecommunications industry as a sensitive economic sector, and they intend to keep its operation under their tight control. For this purpose, they have adopted a series of measures. The State Council has ruled that the state must exercise a unified management of the telecommunications business, thus:

1) Dedicated telecommunications networks are limited to internal use and are not to open to the public.
2) After handling registration procedures at the Industry and Commerce Administration, and paying tax in line with the law, the dedicated telecommunications networks can temporarily operate as part of the public telecommunications business in places that are inaccessible to the public telecommunications network.
3) The MPT will exercise unified management of the long-distance and international telecommunications business.
4) Foreigners are not allowed to operate or manage telecommunications services in China.
5) The Posts Administrative Enterprises are in charge of delivering parcels and letters.

Fast development of telecommunications in China will most likely result in political problems. The introduction of advanced technologies from Western countries and the swiftly increasing penetration of telecommunications will further transform China from a closely held state to an open one. More and more Chinese people will accept Western social and ideological values. It is clear that Beijing has made telecommunications a government monopoly in consideration of economic interests and domestic security. In the foreseeable future, the authorities will not easily change that established policy. However, as mentioned above, the impact produced by the entry of Western technologies and investment into China's market has resulted in tremendous change in Chinese society. Such social changes will influence the readjustment of domestic policies. In the long run, it is questionable whether the government monopoly can last for an extended period.

The International Context

China's modernization is being carried out amid profound changes in the international situation. Peace and development are the main characteristics of the present era. This international environment of peace is expected to continue and hold; the world's science revolution is forging ahead and bringing about changes day by day; adjustment of the industrial structure is accelerating; and international corporations are intensifying global economic competition and testing the integrity of national strength.

However, supply-demand contradictions in the field of telecommunications became a big problem at the early stage of the Open Door period. There were other problems as well, such as poor telecommunications capability, obsolete equipment, backward technology, and scarce services networks. All these problems hindered economic growth and information exchange. In order to catch up with advanced countries, China assigned priority to the development of telecommunications. The policy change brought opportunities to advanced countries as well. Significant amounts of equipment purchasing and technical transfer have occurred between China and foreign manufacturers. These transactions have helped develop China's telecommunications and benefited both China and foreign countries.

Before 1995, a few Internet users were found in the fields of education and scientific research, and there were almost no commercial users. In April of 1995, the MPT began using its ChinaNet network, thereby ending the period of exclusively non-commercial Internet services in China.[27] Today the number of ChinaNet subscribers is 967 times what it was two years ago, and there appears to be no reliable way to predict how fast that demand will increase. Both e-mail and Internet are broadly used to share domestic and international information because of such advantages as their high speed, safety, convenience, privacy, and lack of time limits. Because using the Internet requires the ability to read and write English, most of the users who can get the latest information this way are in universities and high-tech institutions. One hundred and eight institutions of higher learning all over the country, except for the Tibet Autonomous Region, have been connected with the network.[28]

The introduction of the Internet has helped link China closely with the rest of the world, and the country can never return to the self-isolation that existed for almost three decades. Hereafter, whatever changes in the rest of the world will inevitably produce a great impact on China.

Comparison with Advanced Countries

China's telecommunications development involves almost every aspect of communications including local, long-distance, and wireless telephone services, TV, cable TV, and computer networks including the Internet. Generally speaking, the gap is closing between the most advanced countries like the United States and China's big cities and rich rural areas. Gaps still exist between China and the United States in the following areas.

Telephone Services

China's telephone network capacity is among the world's top ten, but its huge population and unbalanced development in different regions make its national telephone penetration rate only 4.6 percent.[29] The United States has a telephone penetration rate of 94 percent.

Phone rates are the major barrier for the six percent of American households without phones, according to a recent study by the Consumer Federation of America and the Benton Foundation. In America, the normal installation fee is approximately $100 and the subscriber is able to use phone services within two weeks of placing an order. In China, the installation fee is around 5,000 yuan (approximately $609.7), which is expensive given the average monthly income of 800 yuan ($97.6) in big cities. The MPT is trying to shorten the telephone installation waiting time to within three months on average.[30]

Chinese telephone subscribers are mostly people in special business positions whose phone bills are paid by the government or companies; the remainder are those who can afford to pay the costly telephone installation fees.

Some other services, such as voice mail and call waiting are common and inexpensive in the United States. However, because of management difficulties, these kinds of services are still not popular in China.

In the United States, fierce competition among long-distance carriers has resulted in good service and lower prices for customers. In China, telephone service is not a fully free market and lack of competition makes for unsatisfactory service.

The Internet

China is making a great effort to connect each household to a telephone line. Telecommunications is becoming more and more important as people increasingly use information. The continuing convergence of communication and computer technologies allows information to be dispersed with greater ease and speed in a wide variety of formats (voice, data, image, and video) to specific audiences (broadcast, narrowcast, or point-to-point).

Although China's online service industry has made enormous progress in the past one or two years, it is still in its infancy compared to developed countries. Many difficulties lie ahead as China moves forward: for example, the scarcity of personal computers and telephones, somewhat high communication costs, and the lack of domestically generated information content.

Online services started ten years earlier in the United States than in China.[31] A high proportion of Americans involved with education or business can access the Internet. More and more people obtain information over the Internet rather than from other sources because it is cheap, easy, fast, and has no time limit. Many people use online services rather than the telephone to chat with friends and family, contact businesses, and make purchases.

Whether we are talking about the information infrastructure, information content, or the number of users, China cannot compare to the United States. However, because of the commercialization of China's technology, the two countries are on nearly the same level as far as applications of on-line technology are concerned. Fortunately, China will not have to repeat the methodical course of development that American software has followed in past years. Nonetheless, full implementation of a comparable high-speed information highway remains costly, and it is unclear if China's financial resources are equal to the task. In addition, the level of skills required for on-line use is still lacking. Currently 200 million people are illiterate in China, and functional illiteracy is widespread. Also, although a significant number of people, especially those in the high-tech area, have benefited from free access to the Internet, many people still do not have access to it because of financial and political limitations.

Some senior officials have called attention to the need for more efficient operation of enterprises in the country's new- and high-tech zones. So far, there are 52 such key zones

across the country, most of them situated in the economically booming eastern part of China. The high-tech zones should fully promote the advantages of local resources to boost key industrial projects. In the coming few years, they should realize more advanced scientific achievements and attract talented people. These zones should also organize the training of entrepreneurs and managers, especially younger ones. The zones' marked achievements over the past few years have stimulated rapid development of the national and local economies. New and high technologies have become a focus of global economic competition, at a time when high-tech industries are shaping China's future.

Development Plans

One of the key indicators of China's rapid development during the Eighth Five-Year Plan period (1991–95) is that the telephone has entered family life, making the transition from office use to private use. Another important factor is that China adopted the most advanced new and high technologies such as the stored program control (SPC) switching system, fiber optics, and satellite communications. Along with fast economic growth and an enhanced degree of "informationization," the telecommunications needs of the state, enterprises, and families have been increasing. In the future, the growth rate of cable TV, computer information networking, and telecommunications is expected to increase. Figures 6-11 reflect trends and expectations.

What does the future hold for Chinese telecommunications? On September 28, 1995, the Fifth Plenary Session of the 14th Central Committee of the Communist Party of China adopted a proposal, "Formulating the Ninth Five-Year Plan (1996–2000) for National Economic and Social Development and the Long-Term Target for the Year 2010." This plan is crucial, as it will be the first long- and medium-term plan since the emergence of China's socialist market economy, as well as being a transcentury blueprint for comprehensive economic and social development.

One major target is that by the end of 2000, telecommunications will meet the developmental needs of the national economy and society, through completion of an integrated, unified, advanced telecommunications network that will extend capabilities and total revenue to twice those of 1995.[32] The Fifth Session of the 14th Chinese Communist Party (CCP) Central Committee adopted a resolution to list communications as one of the key strategic projects of economic construction within the next fifteen years.[33]

By 2000, the total national telecommunications turnover will reach 300 billion yuan ($36.58 billion), with an average annual increase of 25 percent. Telecommunications revenue will total 240 billion yuan ($29.27 billion) with an average annual increase of 20 percent. The cumulative investment in fixed assets will reach 500 billion yuan ($60.98 billion). It is expected that 20 new transprovincial fiber-optic trunks, extending 100,000 km, will be built during the Ninth Five-Year Plan period. Together with the 22 fiber-optic cable trunks built during the Eighth Five-Year Plan period, they will be composed of eight vertical and eight horizontal long-distance network backbones. By 2000, telecommunications data networks will cover all cities at the county level or above. Long-distance telephone switching capacity will increase by 2.5 million lines, bringing the country's total long-distance automatic exchange capacity to 6 million lines.

Some 78.7 million new telephone subscribers (including 14.4 million mobile phone subscribers) will be recruited, bringing the total number of subscribers to 123 million (including 18 million mobile phone owners) by the end of the century. The capacity of

telephone networks will reach 170 million lines, of which the total capacity of central office exchange will reach 140 million lines.[34] Posts and Telecommunications Minister Wu Jichuan announced in 1996 that the MPT will try to raise China's per capita urban telephone coverage rate to between 30 and 40 percent and make telephone access available to every rural village by the turn of the century.[35]

Fig. 6 Total Fixed Assets of Telecoms

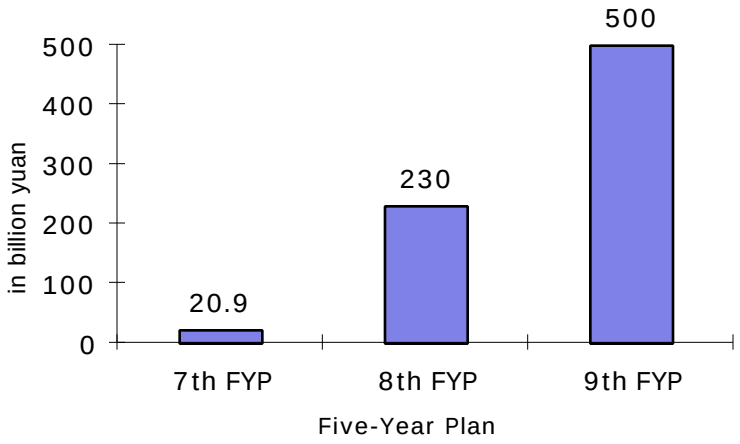


Fig. 7 International Telephone Calls, 1991–1995

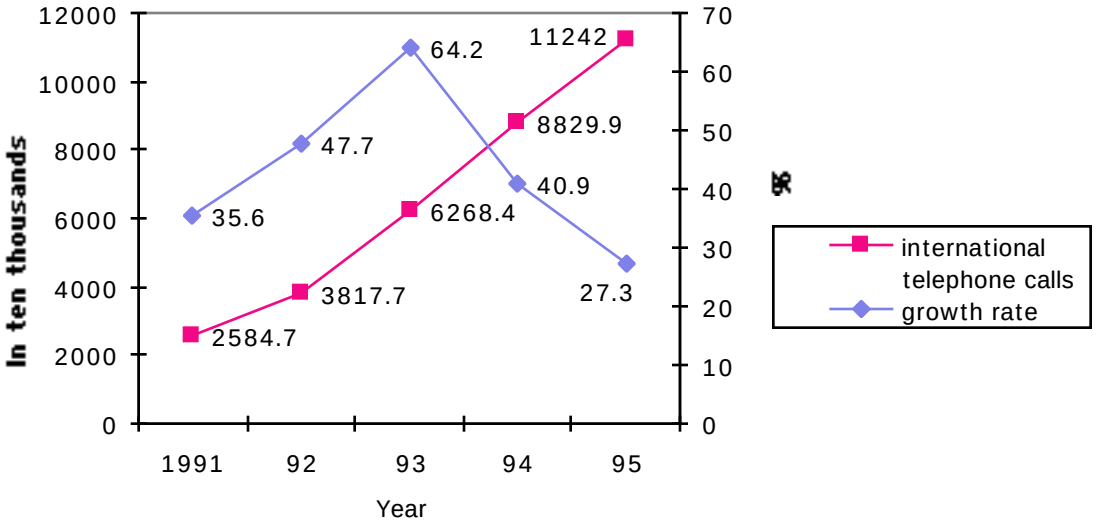


Fig. 8 Telephone Subscriber Growth (mobile not included), 1991–1995

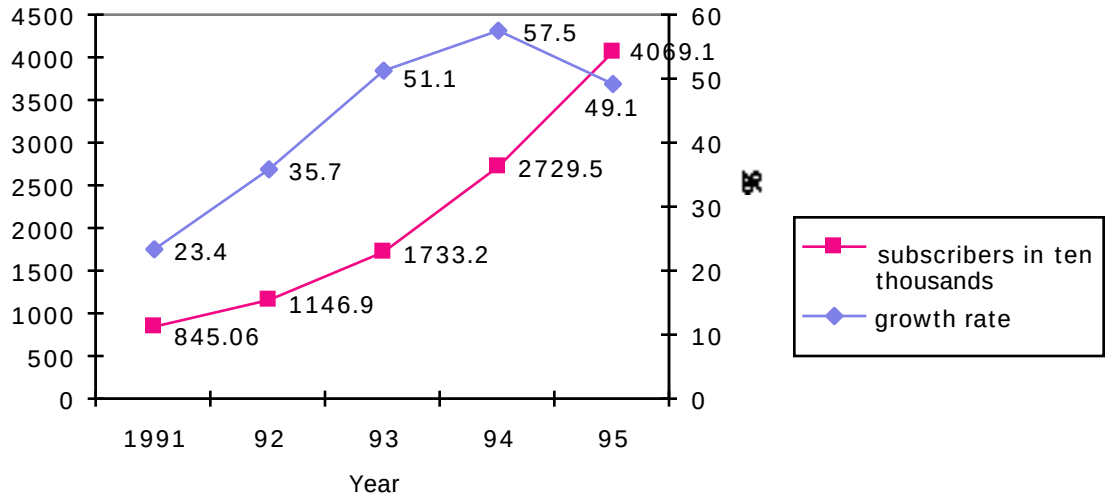


Fig. 9 Radio Paging Subscribers, 1990–2000

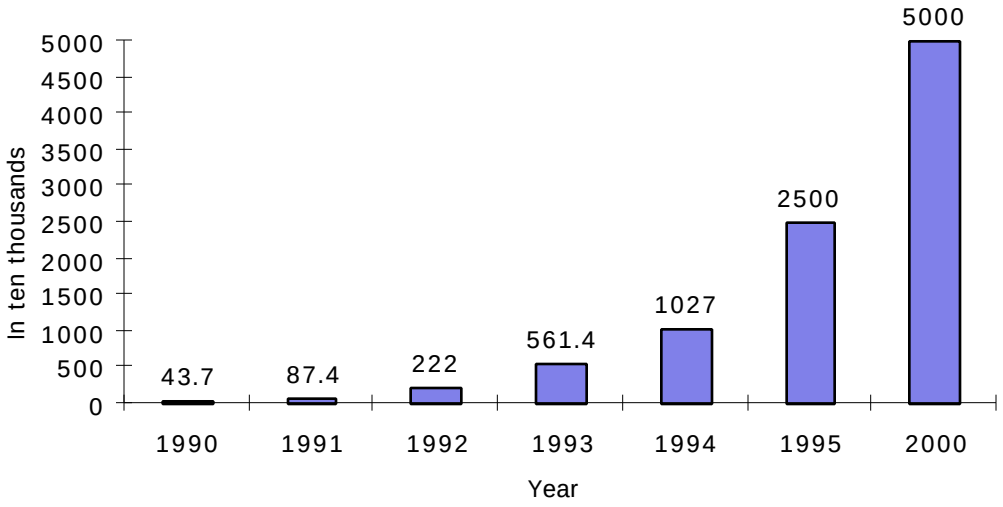


Fig. 10 Mobile Telephone Subscribers, 1988–2000

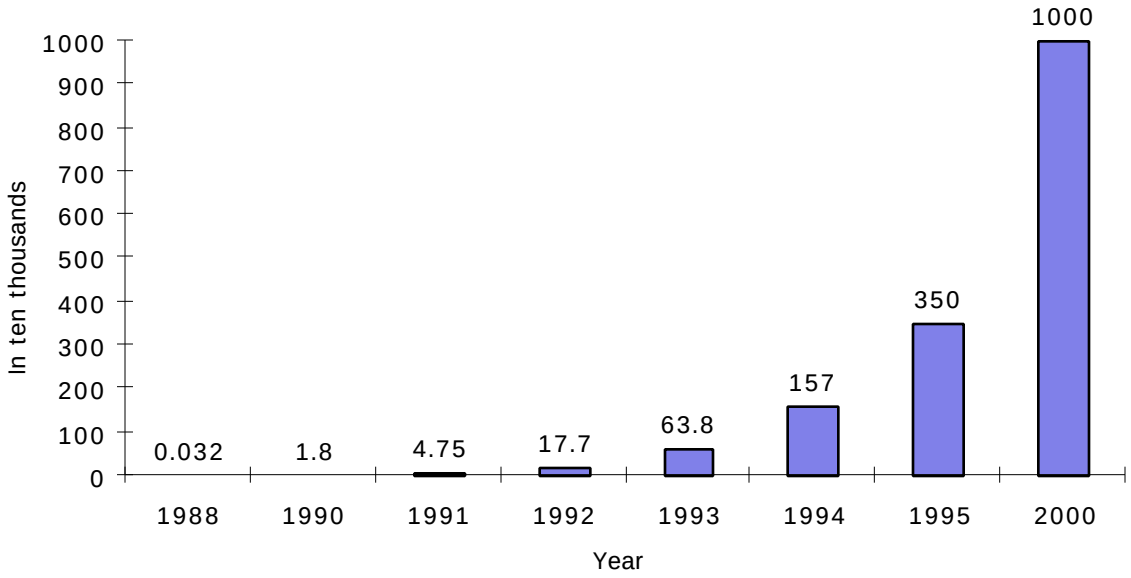
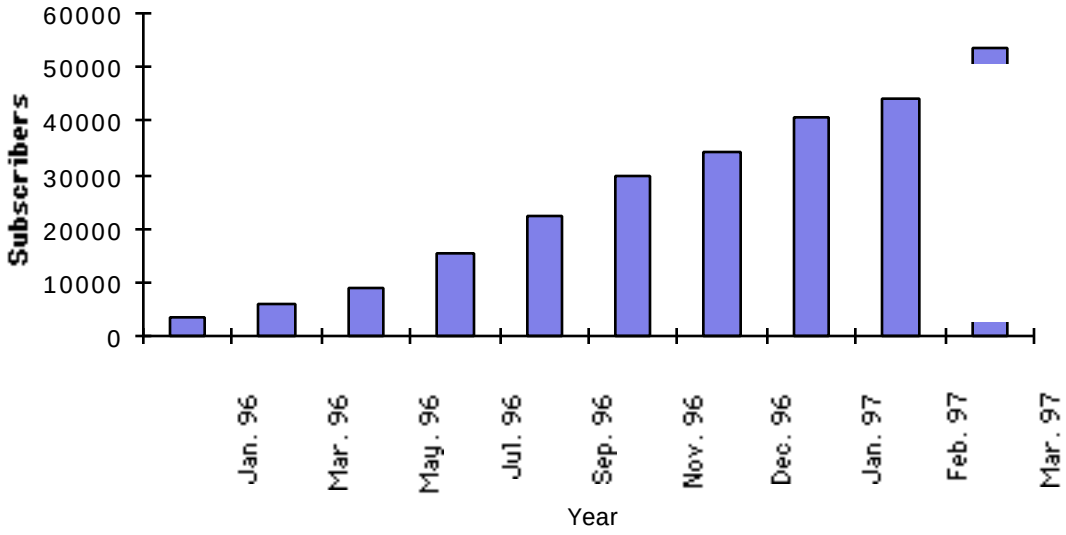


Fig. 11 ChinaNet Subscribers, 1996–1997



Telecommunications Policy

One of the most important reasons for China's success in the telecommunications industry is the large-scale introduction of advanced technologies and equipment from Western countries. The following companies have provided China's mobile communications network with equipment since the 1980s: Alcatel, Ericsson, Siemens, Nokia, Northern Telecom, and Motorola. Three major satellite companies, Lockheed-Martin, Loral, and Hughes, have done business with various ministries in China since the 1980s. Among them, Hughes has captured most of the Chinese market for very small antenna terminals (VSAT). AT&T signed its two biggest contracts ever with the MPT, in March 1996, to provide China the most advanced synchronous digital hierarchy (SDH) equipment for fiber-optic cable.[36] Sprint was the first to provide foreign switching equipment.

Since Beijing began carrying out the Open Door policy in the early 1980s, China has welcomed foreign investment in the telecommunications industry, resulting in an influx of advanced technologies and funds. The industry's great success in recent years has prompted China to adopt flexible and selective policies toward foreign investment in this area. Now, it maintains a policy of prudent selection of foreign technologies and investment.

Areas of investment are divided into four degrees of admissibility: encouragement, permission, constraint, and prohibition. Investment is categorized in this way to help foreign businessmen identify areas in which they may invest and to ensure that their investment interests accord with China's development and that their legal rights and interests are protected. China formulated a series of laws, regulations, and industrial policies relating to foreign investment and applies them to all joint ventures, cooperative enterprises, and enterprises solely run by foreign investment within the territory of China.[37]

Encouraged and Permitted Areas

China's policy is "to compensate for technology with markets." The MPT has announced that China welcomes high, new, and advanced technologies and new equipment that can either improve the performance of products or raise the technical and/or economic effectiveness of domestic enterprises that cannot sufficiently manufacture those products.

At present, investment in the following fields is most encouraged:

- Manufacture of 900 Mbit/s digital cellular communications equipment.
- Manufacture of synchronous optical fiber cable and microwave communications systems with the bit rate over the Fifth Group (565 Mbit/s), SDH optical communications, the relevant measuring equipment, cross-connection equipment, and network management equipment.
- Microwave communications system.
- ATM (asynchronous transfer mode) exchange equipment.

China does not welcome investment by companies intending only to take a share of its telecommunications market without transferring their technologies to China. The MPT has reiterated this policy.

Areas of Constraint

The MPT has put constraints on investment in equipment that China has developed, in technologies transferred to China, and in those products that meet the demand of the domestic market.

Wireless telephone equipment working at frequency bands lower than 450 MHz: This is a band used for specialized communications in the petroleum, coal, water control, and electric power supply sectors, among others. For the time being, domestic manufacturers can satisfy demands of the domestic market in terms of product quality and quantity.

Digital exchange and user switching equipment: China's digital SPC switching equipment can be divided into two categories: large-capacity switching systems, used in exchange offices, that have been developed and manufactured by purely domestic efforts; and switching systems also used in exchange offices but manufactured by joint-venture enterprises.

These switching systems used in exchange offices can basically satisfy the demand of China's current market in terms of quantity. However, China still needs to import a small number of SPC switching systems for some areas where the economy is yet to be developed and for some special telephone functions. In the future, China will strictly limit the number of new workshops to be set up by SPC system manufacturers.

Prohibited Areas

To date, foreign companies and individuals have not been allowed to invest in the operation and management of China's telecommunications services. However, foreign investment in the other aspects of the postal and telecommunications fields is welcome and is to be returned in two different ways, fixed term or fixed interest rate.

China's laws, administrative rules, and regulations prohibit anything that will jeopardize the nation's security, impair the public interest, pollute the environment, destroy natural resources, or imperil human health.

By dividing foreign investment in China's telecommunications industry into the above-mentioned four categories, the Chinese government hopes to sustain development of domestic telecommunications industrial products. However, the government has not achieved its goal in this regard. So far, the Chinese have only slightly altered the prevailing foreign domination of their domestic telecommunications market.

Current Telecommunications Problems

Bureaucracy

China has a hierarchy for planning, organizing, and controlling the telecommunications industry. The MPT is the main government agency responsible for these issues, and it reports to the State Council. However, there are many influential people in the decision-making process, and the power to make decisions usually rests in the hands of several entities. As is well known, this kind of national multilayered structure may cause confusion about policymaking and planning and result in red tape and inefficient use of resources.

Moreover, many officials who are in the position to make decisions are not fully responsible for the outcome. This is a result of China's social and political system: Once an official is placed in a responsible position, he is able to hold it for a long time regardless of job performance. Thus, officials do not have to carefully calculate the probable impact of their decisions. Their lack of efficiency confuses the decision-making process, impedes economic development, and encourages red tape.

In the last five years, China has experienced three failed communication satellite launches. In accordance with Beijing's policy, China's satellites must be launched by its own delivery vehicle, the Long March rocket. Because of the long operational cycle of communications satellites, it takes the Chinese a long time to troubleshoot the failures. It takes at least one year to put a satellite into operation after a customer has placed an order, and two years for a modern large-capacity satellite. The United States and other countries generally purchase a spare satellite to prevent delays in case of a failed launch. This is not the case, however, for China. Apart from a shortage of money, funding a spare satellite would aggravate contention between various units. Some units believe that if a unit orders a satellite and a spare, it must purchase them both. They would argue that otherwise, if this unit failed to launch one satellite, the chance for other companies to place an order would be lost, raising the question of who should absorb the loss. In any case, foreign investors do not lose money. It is China that takes that risk. China will lose at least two years in its satellite communication business because of launch failures.

Shortage of Trained Personnel

Inadequate and poorly qualified staff are common in the fields of information collection, production, testing, conversion, processing, distribution, and utilization. The existing pool of technical personnel for handling information cannot meet such needs of various economic sectors as production, technological development, new product design, foreign trade, commerce, and tourism. Training of information processing specialists is an urgent and difficult task. Greater efforts are needed to increase national awareness about information and to develop competence in its utilization.

Inadequate Competition and Duplication

As China's economy has grown rapidly during the last decade, especially in the telecommunications sector, pagers and cellular phones have become popular symbols of power and wealth. People are inclined to believe that involvement in the telecommunications business will earn them a fortune. In order to accelerate information industry development, the government began encouraging competition. In 1993, the establishment of Liantong, a telecommunications company affiliated with the Ministry of Electronic Industry (MEI), broke the MPT-controlled monopoly over China's telecommunications business. Competition usually results in lower prices, efficiency, and high quality. This has not usually been the case in China, where the state-run monopolies in many industrial sectors have hindered the development of the information industry.

To make matters worse, competition has also resulted in duplicate construction, because most companies want to find the shortest route to profit. In recent years, this has led to problems of wasted time and money. For example, by 1990 there were more than thirty departments in China that had nationwide telecommunications networks of varying extent,

and more than two thousand industrial enterprises had built local dedicated telecommunications networks. In the absence of overall planning, several dedicated networks and public communication lines shared key telecommunications pathways. Several microwave stations or satellite earth stations were built at the same time in one place. Duplicate construction and decentralized maintenance resulted in a low utilization rate of communication lines, interference, a poor quality of telecommunications, and a waste of capital. A number of government agencies are now contending for management of the cable television industry because of its promising returns. At the national level, the Ministry of Radio, Film, and Television (MRFT), the MPT, the Ministry of Education, and the State Wireless Television Commission have vied to become the principal regulatory agency. In order to compete with each other to set up their own telecommunications businesses, they are trying to attract foreign companies to cooperate with them. Nevertheless, duplicate construction will no doubt impede the further development of China's telecommunications.

Foreign Product Domination

Several ministries in China are attempting to cooperate with each other in the battle against foreign challengers. China's telecommunications industry lagged far behind the world ten years ago and required foreign investment and advanced equipment to improve. After more than a decade of development, it has caught up with the world in terms of capability and technology.

Given that situation, foreign companies flooded into China's market without any competition from domestic counterparts. However, there will be a rise in demand for Chinese-made telephones, mobile, satellite, and optical telecommunications, and SDH equipment, most of which are currently foreign products. For example, among the 126 cellular phone manufacturers in China, only four or five plants have an annual production capacity of forty to fifty thousand cellular phones. Their annual output value is $2.5 billion, of which 99 percent came from assembled components imported from foreign countries. In addition, more than 90 percent of mobile telecommunications products sold in China are imported from the United States, Japan, Sweden, Finland, and Germany. Foreign companies are busy competing for big profits, while their Chinese counterparts are still waiting for the government's preferential policies.

Companies preoccupied with making money swarm into profitable areas before conducting careful feasibility studies. The government believes that China should encourage more investment in telecommunications research and development to upgrade outmoded products by introducing foreign advanced technologies and transforming them into products. China hopes to gradually decrease imports of telecommunications equipment as domestic telecommunications companies are established.

Ambiguous Telecom Regulations

China lacks precise general guidelines for telecommunications services and computer information systems, and there is contention among government agencies at both national and local levels. There are no explicit definitions or regulations regarding information resources, protection of software, and fee schedules for profit-making companies and non-profit information services for the public, organizations, and individuals. Such problems will cause market uncertainty and confusion if China cannot solve them in time.

Management of the telecommunications industry is in chaos. In many places, companies have been established one after another, operating according to their own rules and running dedicated equipment without authorization.

Limit to Foreign Capital

China has an urgent need for foreign technology and capital in the national crusade to develop information infrastructure, but current policy prohibits any foreign investment in the operation and management of telecommunications services. Such a policy can discourage foreign investment and technical transfer, and it appears to be a bottleneck in the effort to further develop China's telecommunications.

Moreover, different government agencies have different regulations. For example, Liantong has flexible regulations governing its relations with foreign companies. It is authorized by the Chinese government to share responsibilities for running the telecommunications industry, and it is reportedly allowed to take a shortcut by setting up joint-venture companies of the so-called Zhong Zhong Wai type. This means that a joint venture between a foreign company and a Chinese partner may set up a second joint venture with another Chinese partner, which will be allowed to be involved in the telecommunications operation and its management in the future. This policy is surely more attractive to foreign investors, but it is difficult to carry out and its results are unknown.

Political reforms will involve government departments at both local and national levels. To restore public confidence and win public support for reform, innovative and entrepreneurial measures are required for rapid and sustained economic growth. In order to provide a framework for domestic and foreign investment, Beijing began to adopt new laws and regulations and build an amplified judicial system.

The Problem of Interconnection

The CCP Propaganda Department and other organs fear that opening TV and radio to foreign programming could weaken the propaganda machine that for decades has been a main tool of social control. At the end of 1995, China first set up its own Internet network as an easy access to the outside world. Extraordinary growth has been witnessed since its establishment. More and more people, especially those in high-tech areas, are receiving information this way instead of through TV or radio. The Chinese are exposed to more foreign programs (cable television, satellite television, Internet) than ever before.

Interconnection between networks is important for developing a national information web; however, for strategic reasons existing carriers are hesitant about sharing their networks or working with other carriers. They may believe it will benefit others but harm their own interests through loss of market share, diminishing revenue, and loss of market control. This conservative thinking has hindered the development of a nation-wide information network.

Underdeveloped Information Market

Network penetration in China is low for the following reasons. First, information awareness is weak among the majority of people. Second, the government has placed expensive charges on products and services. This factor will continue to hinder the

growth of medium- and small-scale units. Third, the public lacks computer skills. In addition, the low penetration rate, inadequate supply of information products and services, and lack of good management of information markets hinder development.

Future of China's Telecommunications

Regulatory Transformation

China will continue to limit foreign investment. However, there is the question of what will happen after Hong Kong reverts to Chinese sovereignty in July 1997. An agreement signed recently between Hong Kong Telecom and the Beijing Telecommunications Administrations marked the first significant involvement of foreign investment in the MPT's operation project. After July, Hong Kong's role in the decision-making process is expected to become very important; thus, any telecommunications project that involves Hong Kong may come under serious scrutiny by the Chinese government. Both the MPT and China Unicom have opened branches in Hong Kong and from there both recently purchased Hong Kong Telecom stock. After July, telecommunications in Hong Kong will operate as they do now in the short term; however, in the long run it is unknown who will influence whom.

The MPT implements China's telecommunications policy through its control of network standards, licensing, public network interconnection, and its influence over supply rationalization within the provincial PTA. A key arm of the MPT, the Directorate General of Telecommunications (DGT), operates telecommunications services in China. As a result of the reshuffle of the MPT approved by the State Council in February 1994, DGT has become an entrepreneurial entity known as China Telecom, with an independent accounting system. In practice, China Telecom still depends on funding from the MPT and is under its control. However, in the future, the MPT will probably become China's regulatory telecommunications body, and China Telecom will be a national operator.

Beijing divided foreign investment in the telecommunications industry into different categories, hoping to promote the development of domestic products. Its policy prohibiting foreign investment in telecommunications operation and management was issued because of concerns about loss of control of the profitable industry and about domestic security.

In this regard, the dissolution of HuaMei Communications, a Sino-American joint venture, is a typical example. Years ago, an American telecommunications partnership created HuaMei Communications Incorporated, a 50-50 joint venture between SCM/Brooks Telecommunications and its Chinese partner, the Galaxy New Technology Company. Galaxy is backed up by three major players in China's telecommunications industry: the Commission of Science, Technology, and Industry for National Defense (COSTIND), the MPT through its Data Communications Technology Research Institute, and the MEI through its Communications Telemetry and Telecontrol Research Institute. HuaMei planned to recoup its investment through commercial operations. The joint venture tried to work on the Broad Band Integrated Services Digital Network (B-ISDN) project, a cutting-edge telecommunications technology. Huge investment and technical transfer began to open to the Chinese. However, as it tried to launch commercial services, the company ran up against the government's prohibition of foreign ownership of telecommunications operating ventures. HuaMei was eventually dissolved after nearly two years of operation.

Past experience has proved that the Chinese cannot rapidly develop their economy without large-scale support from the outside world. In September 1995, the CCP central leadership adopted a resolution on a long-term plan for the nation's market-oriented economic development. In accordance with the plan, Beijing's leaders have listed telecommunications as a key strategic project. By 2000, the total national telecommunications turnover will reach 300 billion yuan ($36.58 billion), representing an annual average increase of 25 percent. However, China is facing some major difficulties in its efforts to reach its goals.

Beijing's leaders now face the inevitable bottleneck resulting from its established policies: they cannot sustain rapid development of telecommunications under a government monopoly. Such a policy has frustrated foreign companies, causing them to use aggressive means, in cooperation with their Chinese counterparts, in terms of investment and technical transfer. It is time for Beijing to make a telecommunications policy change toward attracting more investment and more technical transfer from Western countries.

The Advent of Liberalization

The liberalization of China's telecommunications has started, and policy changes are inevitable. As a result of intensive pressure from a number of other ministries that currently have their own private networks—including the MEI, the Ministry of Railways, and the Ministry of Power—the State Council and the State Planning Commission made a decision to give licenses to alternative carriers China Unicom and Ji Tong to compete with the MPT, which initially lost its monopoly in the areas of basic and cellular phone and data communications services.

China Unicom

China Unicom was created in July 1994. It plans to offer a wide variety of fixed and mobile telecommunications services, but its current focus is the cellular market.

Since its creation, China Unicom has attracted intense foreign interest because of its ambitious development goals, huge appetite for capital investment, and the potential opportunity for foreign companies hoping to gain access to China's telecommunications services in the future. China Unicom has signed at least 38 agreements with foreign investors and has invested an estimated 700 million yuan ($82 million) in networks.

According to a news report from the well-informed Hong Kong newspaper *Ming Pao* (May 28, 1997), China Unicom announced that it had permission from the Chinese government to build the second telephone network covering Tianjin, Chongqing, and Sichuan provinces. A big breakthrough for the company, it will provide basic telephone and value-added services. Such increased competition may improve services in China.

Ji Tong

A joint venture made up of 25 Chinese companies with the MEI as its major backup force, Ji Tong was officially approved by the State Council in late 1993. It plans to compete with the MPT in a nationwide data communications infrastructure. It is largely responsible for China's "Golden Projects," which need to be interconnected with MPT data and packet-

switching networks. Ji Tong recently completed the first phase of the Golden Bridge project and established its own national satellite transmission links. Ji Tong operates the Golden Bridge Telecom Network for public economic information and the Golden Bridge computer information services system.[38]

Ministry of Radio, Film and Television (MRFT)

The ministry controls all radio and television programming and operations and is in charge of broadcast and Community Access Television operations. Like the MPT, it follows a strict policy prohibiting foreign involvement in management and operation of TV programming and broadcasting. The MRFT has its own provincial and local networks. Recently, it made a submission to the State Council for approval to build its own fiber-optic cable network, independent of the existing nationwide network under the MPT operation.[39]

There is a long history of conflict between the MRFT and the MPT. The MPT submitted a report to the State Council to voice its opinion that the two ministries should cooperate. The report proposed that the MPT be in charge of the network's construction and the MRFT focus on programming, but the MRFT did not agree. Cable has wide bands which can transmit voice, data, and images. The MRFT reasoned that if it built its own cable network, it could run a more profitable telecommunications business than it could with TV programming alone.

However, it has been said that "Pay-TV is the future, but it comes with its own complications."[40] One complication is getting viewers to pay and developing ways to collect fees. Television has always been seen as "free" and Chinese audiences are still not keen on paying extra money for a greater variety of programs. While the idea of pay TV is slowly spreading, there are technical problems still to be resolved. One problem is that cable services have to be available to a whole block or community, yet it is very difficult to get people to pay for the services.

Agreement at the top level has not filtered down to some local areas. However, Hainan province has set up an excellent model for cooperation between the local PTA and local bureaus of the MRFT. In Hainan, only one cable TV network will be built. The telecommunications departments will take responsibility for the fiber-optic network construction, while the MRFT departments will be in charge of cable TV programming production.

The MPT remains a major decision maker in China's telecommunications policy and development. "It is necessary to make sure that telecommunications must be under the unified management of the State," Premier Li Peng announced in 1996. "This is a symbol of state sovereignty. However, other industries are allowed to build their own telecommunications networks, also under the unified management of the State, as a supplement to the State telecommunications network."[41]

Competition may result in low prices and high quality, and it will accelerate telecommunications development. However, some consideration should be given to the goals of competition. Along with rapid economic development and increased international trade, telecommunications have become more important than ever and benefited those running the business. Profit-oriented competition in this industry will produce a disaster because in China, most telecommunications carriers are state-run companies. Officials can use the state money to do their own business.

China continues to uphold its ban on foreign equity participation in telecommunications management and operation. As the major ministry for carrying out this policy, the MPT has

remained fairly open to working on cooperation agreements with foreign operators. However, foreign operators are more interested in holding the majority share and foreign investors have a strong interest in participating in China's network development, operation, and services.

The MPT's competitors do not have as many qualified and experienced engineers as it does, and they are short of basic infrastructure that the MPT possesses. However, they have more flexible policies to develop telecommunications, even though these policies have not yet been implemented. Wasted time and investment can be averted through cooperation. Although it will take the Chinese a long time to reach their goal, China's telecommunications sector is attractive to investors.

Value-Added Services and Advanced Technologies

Wireless Local Loop (WLL), Personal Communications System (PCS), fiber-to-the-curb (FTTC), and fiber-to-the-home (FTTH) should have a bright future in China if the MPT can set standards for them. Growth can be expected in pager and cellular phones that have various functions, such as two-way pagers, international roaming services, and remote Internet access. In the big cities and affluent areas, value-added services such as call waiting, voice-mail services, and phone cards will find valuable markets.

China's situation is unique. With a huge population, unbalanced economic and telecommunications development among provinces, and great geographical variations, China needs to develop and open up to alternative technologies to meet its goal. Copper will remain the access medium of choice in the near future, primarily because of cost and availability considerations. The low price of twisted pair as well as low labor costs make copper a less expensive alternative in China than in many countries. Copper twisted pair is manufactured locally and is thus immediately available. Fiber-optic access markets are opening up. China has 22 fiber-optic cables, and it plans to add 20 more during the Ninth Five-Year Plan period. The high cost of fiber-optic cable will keep it out of reach for most local PTAs, which must focus more on the quantity of new lines installed rather than their quality.

Fiber-optic access is expected to be primarily FTTC or FTTH, with copper as the final transmission medium to subscribers. This technology will be limited to more developed cities in China over the next few years.

The cost of WLL falls between that of fiber optic and copper. It has been one of the hot items for suppliers in China's market. PCS is more like a cellular phone. It operates in the 1.8 GHz range and offers higher capacity but requires more base stations and has calling distance limitations. China's densely populated urban areas seem well suited for both WLL and PCS technologies, which could be an economical solution.

There has been no frequency allocated to WLL and PCS services as yet on the national level. The MPT planned to test four WLL systems in 1996. The Chinese should give more consideration to the cost and quality of PCS installation. In fact, PCS technology is formally being considered under National Plan No. 863, an advanced technology development blueprint. However, further PCS market activity is not expected until 1997–1998. Much will depend on the success of PCS in the Hong Kong market, where both the MPT and Unicom have entered bids to become PCS operators.

The development of satellite communications, reflecting the development level of telecommunications networks, represents the overall level of the science, technology, and industry of a given country. China started to produce its own satellites quite early, though it

witnessed slow progress compared with the most advanced countries. China successfully launched three small-capacity application communication satellites during the 1980s, bringing it to the technological level of the United States in the 1960s. It was ranked as one of the few countries capable of launching self-developed communications satellites after the United States, the former Soviet Union, France, Germany, and Canada.

In recent years, three failures in launching China's communications satellites by Long March rockets intensified the shortage of space technology resources. The Chinese are turning to foreign satellite systems for space segment communications and broadcasting resources. Foreign satellite systems have easy access to China's market: currently, 23 out of 40 transponder units are leased or purchased from other countries. Such a situation is incompatible with domestic development.

TV programs, the information highway, multimedia communications, and PCS are all using satellite communications technology. The application of satellite communications is expected to reach a new peak at the turn of the new century. As a large developing country, China should participate in a number of international systems.

Currently, only the MPT may provide Internet services through its Data Communication Bureau. Foreign companies are restricted from direct participation in the market. The Chinese government has blocked certain access from the United States and some other countries because of its worry about computer pornography and political content. All the international Internet access must go through the MPT. However, the Internet will prosper in China despite strict government limitations if there is political stability and sustained economic growth.

China's telecommunications has achieved great success in the past years, and China will continue to be the biggest telecommunications market in the world. It already possesses the most advanced technologies, and if China's leaders solve the existing problems, the nation's telecommunications could be the most powerful in the world in terms of capacity and capability. In the future, China could help the telecommunications sector in developing countries and play a major role in the international trade.

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